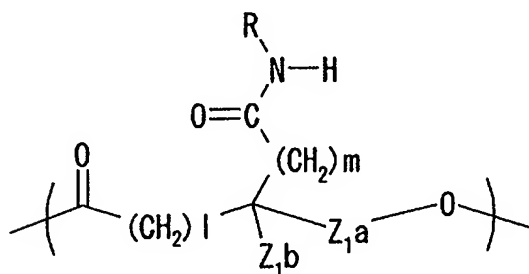


# CLAIMS

1. A charge control agent for controlling a charged state of powder, characterized by comprising one or more units each represented by the following  
5 chemical formula (1) in a molecule:



(in the formula:

R represents  $-\text{A}_1-\text{SO}_2\text{R}_1$ ;

R<sub>1</sub> represents OH, a halogen atom, ONa, OK, or  
10 OR<sub>1a</sub>; and

R<sub>1a</sub> and A<sub>1</sub> each independently represent a group having a substituted or unsubstituted aliphatic hydrocarbon structure, a substituted or unsubstituted aromatic ring structure, or a substituted or  
15 unsubstituted heterocyclic structure;

in addition, with regard to l, m, Z<sub>1a</sub>, and Z<sub>1b</sub> in the formula:

when l represents an integer selected from 2 to 4, Z<sub>1a</sub> represents nothing or a linear alkylene chain  
20 having 1 to 4 carbon atoms, Z<sub>1b</sub> represents a hydrogen atom, and m represents an integer selected from 0 to 8;

when l represents 1 and Z<sub>1a</sub> represents a linear

alkylene chain having 1 to 4 carbon atoms,  $Z_{1b}$  represents a hydrogen atom and  $m$  represents an integer selected from 0 to 8;

when  $l$  represents 1 and  $Z_{1a}$  represents nothing,  
5  $Z_{1b}$  represents a hydrogen atom and  $m$  represents 0;

when  $l$  represents 0 and  $Z_{1a}$  represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain may be substituted by a linear or branched alkyl group, or an alkyl group containing a  
10 residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,  $Z_{1b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl  
15 group, and  $m$  represents an integer selected from 0 to 8; and

when  $l$  represents 0 and  $Z_{1a}$  represents nothing,  $Z_{1b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group  
20 which may be substituted by an aryl group, and  $m$  represents an integer selected from 0 to 8;

in addition, when multiple units exist,  $R$ ,  $R_1$ ,  $R_{1a}$ ,  $A_1$ ,  $Z_{1a}$ ,  $Z_{1b}$ ,  $l$ , and  $m$  each independently have the above meaning for each unit.)

25 2. A charge control agent according to claim 1, characterized in that the one or more units each represented by the chemical formula (1) are each



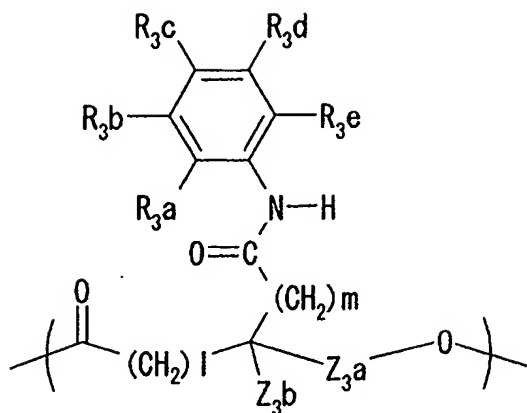
Z<sub>2b</sub> represents a hydrogen atom and m represents 0;

when l represents 0 and Z<sub>2a</sub> represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain may be substituted by a linear or  
5 branched alkyl group, or an alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof, Z<sub>2b</sub> represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or  
10 aralkyl group which may be substituted by an aryl group, and m represents an integer selected from 0 to 8; and

when l represents 0 and Z<sub>2a</sub> represents nothing, Z<sub>2b</sub> represents a hydrogen atom, or a linear or  
15 branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group, and m represents an integer selected from 0 to 8;

in addition, when multiple units exist, R<sub>2</sub>, R<sub>2a</sub>, A<sub>2</sub>, Z<sub>2a</sub>, Z<sub>2b</sub>, l, and m each independently have the  
20 above meaning for each unit.)

3. A charge control agent according to claim 1, characterized in that the one or more units each represented by the chemical formula (1) are each represented by the following chemical formula (3):



(in the formula, at least one of R<sub>3a</sub>, R<sub>3b</sub>, R<sub>3c</sub>, R<sub>3d</sub>, and R<sub>3e</sub> represents SO<sub>2</sub>R<sub>3f</sub> (R<sub>3f</sub> represents OH, a halogen atom, ONa, OK, or OR<sub>3f1</sub>. R<sub>3f1</sub> represents a linear or branched alkyl group having 1 to 8 carbon atoms, or a substituted or unsubstituted phenyl group.), and the others each independently represent a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms, an alkoxy group having 1 to 20 carbon atoms, an OH group, an NH<sub>2</sub> group, an NO<sub>2</sub> group, COOR<sub>3g</sub> (R<sub>3g</sub> represents an H atom, an Na atom, or a K atom.), an acetamide group, an OPh group, an NHPh group, a CF<sub>3</sub> group, a C<sub>2</sub>F<sub>5</sub> group, or a C<sub>3</sub>F<sub>7</sub> group;

in addition, with regard to l, m, Z<sub>3a</sub>, and Z<sub>3b</sub> in the formula:

when l represents an integer selected from 2 to 4, Z<sub>3a</sub> represents nothing or a linear alkylene chain having 1 to 4 carbon atoms, Z<sub>3b</sub> represents a hydrogen atom, and m represents an integer selected from 0 to 8;

when l represents 1 and Z<sub>3a</sub> represents a linear

alkylene chain having 1 to 4 carbon atoms, Z<sub>3b</sub> represents a hydrogen atom and m represents an integer selected from 0 to 8;

when l represents 1 and Z<sub>3a</sub> represents nothing,  
5 Z<sub>3b</sub> represents a hydrogen atom and m represents 0;

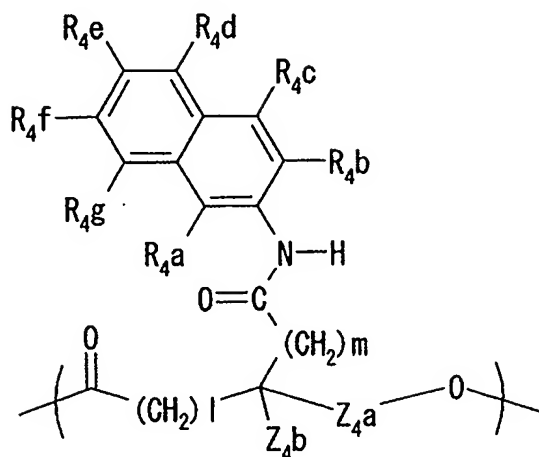
when l represents 0 and Z<sub>3a</sub> represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain may be substituted by a linear or branched alkyl group, or an alkyl group containing a  
10 residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof, Z<sub>3b</sub> represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl  
15 group, and m represents an integer selected from 0 to 8; and

when l represents 0 and Z<sub>3a</sub> represents nothing, Z<sub>3b</sub> represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group  
20 which may be substituted by an aryl group, and m represents an integer selected from 0 to 8;

in addition, when multiple units exist, R<sub>3a</sub>, R<sub>3b</sub>, R<sub>3c</sub>, R<sub>3d</sub>, R<sub>3e</sub>, R<sub>3f</sub>, R<sub>3f1</sub>, R<sub>3g</sub>, Z<sub>3a</sub>, Z<sub>3b</sub>, l, and m each independently have the above meaning for each unit.)

25 4. A charge control agent according to claim 1, characterized in that the one or more units each represented by the chemical formula (1) are each

represented by the following chemical formula (4A) or (4B) :



- (in the formula, at least one of  $R_{4a}$ ,  $R_{4b}$ ,  $R_{4c}$ ,  $R_{4d}$ ,  $R_{4e}$ ,  $R_{4f}$ , and  $R_{4g}$  represents  $SO_2R_{4o}$  ( $R_{4o}$  represents OH, a halogen atom, ONa, OK, or  $OR_{4o1}$ .  $R_{4o1}$  represents a linear or branched alkyl group having 1 to 8 carbon atoms, or a substituted or unsubstituted phenyl group.), and the others each independently represent
- 5 a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms, an alkoxy group having 1 to 20 carbon atoms, an OH group, an  $NH_2$  group, an  $NO_2$  group,  $COOR_{4p}$  ( $R_{4p}$  represents an H atom, an Na atom, or a K atom.), an acetamide group, an OPh group, an NHPH group, a  $CF_3$  group, a  $C_2F_5$  group, or a  $C_3F_7$  group;
- 10
- 15

in addition, with regard to  $l$ ,  $m$ ,  $Z_{4a}$ , and  $Z_{4b}$  in the formula:

- when  $l$  represents an integer selected from 2 to 4,  $Z_{4a}$  represents nothing or a linear alkylene chain
- 20 having 1 to 4 carbon atoms,  $Z_{4b}$  represents a hydrogen

atom, and m represents an integer selected from 0 to 8;

when l represents 1 and  $Z_{4a}$  represents a linear alkylene chain having 1 to 4 carbon atoms,  $Z_{4b}$  represents a hydrogen atom and m represents an integer selected from 0 to 8;

when l represents 1 and  $Z_{4a}$  represents nothing,  $Z_{4b}$  represents a hydrogen atom and m represents 0;

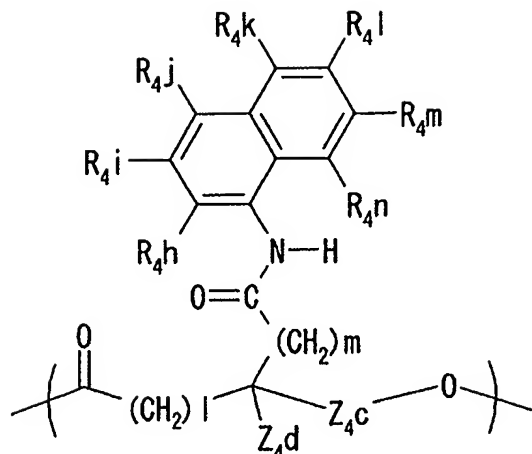
when l represents 0 and  $Z_{4a}$  represents a linear alkylene chain having 1 to 4 carbon atoms, the linear alkylene chain may be substituted by a linear or branched alkyl group, or an alkyl group containing a residue having any one of a phenyl structure, a thienyl structure, and a cyclohexyl structure at a terminal thereof,  $Z_{4b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group, and m represents an integer selected from 0 to 8; and

when l represents 0 and  $Z_{4a}$  represents nothing,  $Z_{4b}$  represents a hydrogen atom, or a linear or branched alkyl group, aryl group, or aralkyl group which may be substituted by an aryl group, and m represents an integer selected from 0 to 8;

in addition, when multiple units exist,  $R_{4a}$ ,  $R_{4b}$ ,  $R_{4c}$ ,  $R_{4d}$ ,  $R_{4e}$ ,  $R_{4f}$ ,  $R_{4g}$ ,  $R_{4o}$ ,  $OR_{4o1}$ ,  $R_{4p}$ ,  $Z_{4a}$ ,  $Z_{4b}$ , l, and m each independently have the above meaning for each



unit)



(in the formula, at least one of  $R_{4h}$ ,  $R_{4i}$ ,  $R_{4j}$ ,  $R_{4k}$ ,  $R_{4l}$ ,  $R_{4m}$ , and  $R_{4n}$  represents  $SO_2R_{4o}$  ( $R_{4o}$  represents OH, a  
 5 halogen atom, ONa, OK, or  $OR_{4o1}$ .  $R_{4o1}$  represents a linear or branched alkyl group having 1 to 8 carbon atoms, or a substituted or unsubstituted phenyl group.), and the others each independently represent a hydrogen atom, a halogen atom, an alkyl group  
 10 having 1 to 20 carbon atoms, an alkoxy group having 1 to 20 carbon atoms, an OH group, an  $NH_2$  group, an  $NO_2$  group,  $COOR_{4p}$  ( $R_{4p}$  represents an H atom, an Na atom, or a K atom.), an acetamide group, an OPh group, an NHPH group, a  $CF_3$  group, a  $C_2F_5$  group, or a  $C_3F_7$  group;

15 in addition, with regard to  $l$ ,  $m$ ,  $Z_{4c}$ , and  $Z_{4d}$  in the formula:

when  $l$  represents an integer selected from 2 to 4,  $Z_{4c}$  represents nothing or a linear alkylene chain having 1 to 4 carbon atoms,  $Z_{4d}$  represents a hydrogen  
 20 atom, and  $m$  represents an integer selected from 0 to

8;

when 1 represents 1 and  $Z_{4c}$  represents a linear  
alkylene chain having 1 to 4 carbon atoms,  $Z_{4d}$   
represents a hydrogen atom and m represents an  
5 integer selected from 0 to 8;

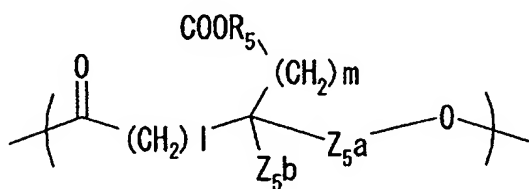
when 1 represents 1 and  $Z_{4c}$  represents nothing,  
 $Z_{4d}$  represents a hydrogen atom and m represents 0;

when 1 represents 0 and  $Z_{4c}$  represents a linear  
alkylene chain having 1 to 4 carbon atoms, the linear  
10 alkylene chain may be substituted by a linear or  
branched alkyl group, or an alkyl group containing a  
residue having any one of a phenyl structure, a  
thienyl structure, and a cyclohexyl structure at a  
terminal thereof,  $Z_{4d}$  represents a hydrogen atom, or a  
15 linear or branched alkyl group, aryl group, or  
aralkyl group which may be substituted by an aryl  
group, and m represents an integer selected from 0 to  
8; and

when 1 represents 0 and  $Z_{4c}$  represents nothing,  
20  $Z_{4d}$  represents a hydrogen atom, or a linear or  
branched alkyl group, aryl group, or aralkyl group  
which may be substituted by an aryl group, and m  
represents an integer selected from 0 to 8;

in addition, when multiple units exist,  $R_{4h}$ ,  $R_{4i}$ ,  
25  $R_{4j}$ ,  $R_{4k}$ ,  $R_{4l}$ ,  $R_{4m}$ ,  $R_{4n}$ ,  $R_{4o}$ ,  $OR_{4o1}$ ,  $R_{4p}$ ,  $Z_{4c}$ ,  $Z_{4d}$ , 1, and m  
each independently have the above meaning for each  
unit.)

5. A charge control agent for controlling a charged state of powder, characterized by comprising one or more units each represented by the following chemical formula (5) in a molecule:



5

(in the formula:

R<sub>5</sub> represents hydrogen, a group for forming a salt, or R<sub>5a</sub>, and R<sub>5a</sub> represents a linear or branched alkyl group having 1 to 12 carbon atoms, or aralkyl group;

10

in addition, with regard to l, m, Z<sub>5a</sub>, and Z<sub>5b</sub> in the formula:

when l represents an integer selected from 2 to 4, Z<sub>5a</sub> represents nothing or a linear alkylene chain having 1 to 4 carbon atoms, Z<sub>5b</sub> represents a hydrogen atom, and m represents an integer selected from 0 to 8;

15

when l represents 1 and Z<sub>5a</sub> represents a linear alkylene chain having 1 to 4 carbon atoms, Z<sub>5b</sub> represents a hydrogen atom and m represents an integer selected from 0 to 8;

20

when l represents 1 and Z<sub>5a</sub> represents nothing, Z<sub>5b</sub> represents a hydrogen atom and m represents 0;

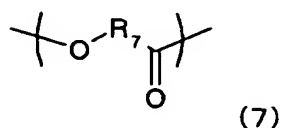
when l represents 0 and Z<sub>5a</sub> represents a linear

alkylene chain having 1 to 4 carbon atoms, the linear  
 alkylene chain may be substituted by a linear or  
 branched alkyl group, or an alkyl group containing a  
 residue having any one of a phenyl structure, a  
 5 thienyl structure, and a cyclohexyl structure at a  
 terminal thereof,  $Z_{5b}$  represents a hydrogen atom, or a  
 linear or branched alkyl group, aryl group, or  
 aralkyl group which may be substituted by an aryl  
 group, and  $m$  represents an integer selected from 0 to  
 10 8; and

when  $l$  represents 0 and  $Z_{5a}$  represents nothing,  
 $Z_{5b}$  represents a hydrogen atom, or a linear or  
 branched alkyl group, aryl group, or aralkyl group  
 which may be substituted by an aryl group, and  $m$   
 15 represents an integer selected from 0 to 8;

in addition, when multiple units exist,  $R_5$ ,  $R_{5a}$ ,  
 $Z_{5a}$ ,  $Z_{5b}$ ,  $l$ , and  $m$  each independently have the above  
 meaning for each unit.)

6. A charge control agent according to any one  
 20 of claims 1 to 5, characterized by further comprising  
 a unit represented by the following chemical formula  
 (7) in a molecule:



(in the formula,  $R_7$  represents a linear or branched

alkylene group having 1 to 11 carbon atoms, an  
alkyleneoxyalkylene group each alkylene of which has  
1 to 2 carbon atoms, or an alkylidene group having 1  
to 5 carbon atoms which may be substituted by aryl as  
5 desired;

in addition, when multiple units exist,  $R_7$   
independently has the above meaning for each unit.)

7. A charge control agent according to any one  
of claims 1 to 6, wherein the powder comprises toner  
10 for developing an electrostatic charge image.

8. A toner for developing an electrostatic  
charge image, characterized by comprising at least:

a binder resin;

a colorant; and

15 the charge control agent according to any one of  
claims 1 to 6.

9. An image forming method, comprising at least  
the steps of:

applying a voltage from an outside to a charging  
20 member to charge an electrostatic latent image-  
bearing member;

forming an electrostatic charge image on the  
charged electrostatic latent image-bearing member;

developing the electrostatic charge image with  
25 toner for developing an electrostatic charge image to  
form a toner image on the electrostatic latent image-  
bearing member;

transferring the toner image on the  
electrostatic latent image-bearing member onto a  
recording material; and

fixing the toner image on the recording material  
5 under heating, characterized in that the toner for  
developing an electrostatic charge image according to  
claim 8 is used.

10. An image forming apparatus, comprising at  
least:

10 means for applying a voltage from an outside to  
a charging member to charge an electrostatic latent  
image-bearing member;

means for forming an electrostatic charge image  
on the charged electrostatic latent image-bearing  
15 member;

means for developing the electrostatic charge  
image with toner for developing an electrostatic  
charge image to form a toner image on the  
electrostatic latent image-bearing member;

20 means for transferring the toner image on the  
electrostatic latent image-bearing member onto a  
recording material; and

means for fixing the toner image on the  
recording material under heating, characterized in  
25 that the toner for developing an electrostatic charge  
image according to claim 8 is used.